

REMARKS

Amendments to claims 56 and 103 are to incorporate limitations from respective canceled claims 93 and 104. No new matter has been added.

I. Claim rejections under 35 U.S.C. § 102 based on Pelc.

Claims 56, 66, 67, 81, 103, 113, and 114 stand rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by U.S. Patent No. 5,051,903 (Pelc). Applicant respectfully notes that in order to sustain a claim rejection under § 102, each of the claim elements must be found, either expressly or inherently, in the cited reference.

Claims 56 and 103

Claim 56 recites that the *image phase* value is *calculated using the phase value of the breathing cycle* (Emphasis Added). Claim 103 recites similar limitations. Pelc does not disclose or suggest these limitations. According to the Office Action, column 9, lines 15-38 and 55-65 of Pelc allegedly disclose the above limitations. However, the cited passages of Pelc actually disclose:

A respiration monitoring system, generally designated 70, is connected to the NMR system 40 to provide the computer 44 with ordering information for the gradients Gy per the present invention. A respiration transducer 72 produces a respiration signal dependant on the chest wall position of the imaged patient. Such a transducer may be a mechanical bellows-type, belt transducer that measures chest motion.

The respiration signal 73 is received by summing junction 80 and voltage controlled amplifier 78 which adjust the baseline and amplitude of the respiration signal according to an offset control value 75' and a scaling value 77' to be described below. The adjusted signal 79' is processed by an analog-to-digital converter ("A/D") 86 which provides a digitized representation of the respiration signal 79 to processor 88. *The digitized respiration signal 79 is applied to processor 88 which stores certain values of the respiration signal y(t) in a database in random access*

memory ("RAM") 84 for use in calculating the phase values $\phi(y)$ as have been described. The phase values $\phi(y)$ are used to select the order of the gradients G_y in the NMR scan and are calculated by a main program 75 and communicated to the pulse control module 42 through computer 44.

In accordance with the invention, the respiration signal $y(t)$ is mapped to an equiprobable phase signal. In order to determine the phase transfer function $\phi(y)$, an integral histogram is compiled on a value by value basis from a database which stores previous values of the respiration signal $y(t)$. The acquisition of the data for the database will be discussed in detail below.

Each value $\phi(y)$ may be calculated as needed from the data base according to the following formula:

$$\phi(y_i) = (N_L + (N_E/2)) / N_T$$

Thus, the cited passages of Pelz actually disclose phase values for a breathing cycle, which are derived from the respiration signals 79. However, there is nothing in Pelz that discloses or suggests using the phase value(s) $\phi(y)$ to calculate any image phase (Note that claim 56 describes that once the phase value is obtained, it is used to calculate an image phase). For at least the foregoing reasons, claims 56 and 103, and their respective dependent claims, should be allowable over Pelc.

Claim 56 also recites assigning the image phase value for the image data using a processor, wherein the act of assigning results in binning of the image data. Claim 103 recites similar limitations. Pelc also does not disclose or suggest these limitations. According to the Office Action, column 10, lines 25-55 of Pelc allegedly disclose assigning image phase value for image data. However, the cited passages of Pelc actually disclose:

After N_T samples have been acquired, the data acquisition enters a "rolling" mode where the earliest sampled value of $y(t)$ is replaced with the latest sampled value of $y(t)$ so that the total number of samples N_T

remains constant. Sufficient data has now been collected to permit the construction of an integral histogram according to equation 1 above.

At time T_A after the rolling data acquisition has begun, NMR scanning is initiated. The offset control value 75' and scaling value 77' are frozen. *Phase values $\phi(y_i)$ are computed and gradients $Gy(i)$ assigned to the acquired NMR signals* as described above. At time T_b , when N_T samples have been acquired after T_A the data acquisition switches from a "rolling" mode to a "growing" mode. In the growing mode, N_T is increased for each additional value of $y(t)$ sampled and no data in the database is deleted. With a growing database, during the early portion of the scan, each respiration value $y(t_i)$ is evaluated against a histogram compiled of relatively little data N_T . The histogram may change more quickly to accommodate changes in the breathing pattern and in the early part of the scan, such changes are acceptable because relatively few gradient values have been used. Late in the scan there is considerably more data in the database and changes in the breathing pattern do not affect the histogram as much. This satisfies the requirement that the changes in the histogram be limited after more gradients have been sorted so that the sorting of the earlier gradients "corresponds" with the sorting of the later gradients.

Thus, the above cited passage of Pelc actually discloses assigning "gradients" to NMR signals, and does not disclose or suggest any image "phase" for the NMR image signals. It is important to note that the gradient Gy in Pelz is part of a selected pulse sequence (see figures 1 and column 8, lines 62-65), and thus, it is clearly not any image phase that is calculated from any phase value. Also, the above cited passage does not disclose or suggest that the assigning of the "gradients" itself bins image data. For these additional reasons, claims 56 and 103, and their respective dependent claims, should be allowable over Pelc.

II. Claim rejections under 35 U.S.C. § 102 based on Polz.

Claims 56, 66, 67, 81, 103, 113, and 114 stand rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by U.S. Patent No. 5,924,989 (Polz).

Claims 56 and 103

Claim 56 recites that the *image phase* value is *calculated using the phase value of the breathing cycle* (Emphasis Added). Claim 103 recites similar limitations. Polz does not disclose or suggest these limitations. According to the Office Action, column 5, lines 4-12 and 38-60, and column 6, lines 25-31 of Polz allegedly disclose the above limitations. However, the cited passages of Polz actually disclose phases of a cardiac cycle / breathing cycle (e.g., exhalation phase, inhalation phase). There is nothing in Polz that discloses or suggests using the cardiac / breathing phase to calculate any image phase (Note that claim 56 describes that once the phase value is obtained, it is used to calculate an image phase). For at least the foregoing reasons, claims 56 and 103, and their respective dependent claims, should be allowable over Polz.

Claim 56 also recites assigning the image phase value for the image data using a processor, wherein the act of assigning results in binning of the image data. Claim 103 recites similar limitations. According to the Office Action, column 3, lines 2-9 of Polz allegedly disclose assigning image phase value for image data. As discussed, Polz does not disclose or suggest using cardiac / breathing phase to calculate any image phase. Also, there is nothing in the cited passage of Polze that discloses or suggests the assigning of image phase for image data itself results in binning of image data. For these additional reasons, claims 56 and 103, and their respective dependent claims, should be allowable over Polz.

CONCLUSION

If the Examiner has any questions or comments, please contact the undersigned at the number listed below.

To the extent that any arguments and disclaimers were presented to distinguish prior art, or for other reasons substantially related to patentability, during the prosecution of any and all parent and related application(s)/patent(s), Applicant(s) hereby explicitly retracts and rescinds any and all such arguments and disclaimers, and respectfully requests that the Examiner re-visit the prior art that such arguments and disclaimers were made to avoid.

The Commissioner is authorized to charge any fees due in connection with the filing of this document to Vista IP Law Group's Deposit Account No. **50-1105**, referencing billing number **VM 03-035-US**. The Commissioner is authorized to credit any overpayment or to charge any underpayment to Vista IP Law Group's Deposit Account No. **50-1105**, referencing billing number **VM 03-035-US**.

Respectfully submitted,

DATE: November 21, 2011

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